MEDTEC SCHOOL

Course: Statistics

Year: 2nd

Period: 1st semester

Credits: 6

Objectives

The course aims to introduce students to statistics and its application to problems arising from medicine and clinical practice.

The main objectives of the course are:
- *To provide techniques and tools for the synthetic and graphical analysis of the information provided by clinical data sets;*
- *To introduce to the language and the models for the representation and the analysis of random phenomena, with particular focus 1 0 0 1 W*hBT/F3 n10 gg0.0004 u2887ID 17/9 particlar focus 1*

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Contents

Block1: How to describe medical data. [8h]

- Samples and populations. Location and dispersion indexes (mean, median, quantiles, variance, standard deviation, range and IQR). Graphics for continuous, discrete and categorical variables (histograms, boxplot, pie charts, qqplot). How to describe dependency: variance-covariance matrix,

correlation.

- The concept of Probability and Conditional Probability. Bayes formula and total probability theorem.

- Density Function (PDF) and Cumulative Density Function (CDF) for discrete variables (Bernoulli, Binomial and Poisson) and continuous variables (Uniform, Gaussian, Exponential). Focus on Gaussian computations.

- Point estimation: mean and variance estimators, bias and mean square error of an estimator.

Block2: How to test for evidence. [6+6 hours]

- Hypothesis testing procedure (Z and T test for the mean of Gaussian samples), significance level, power function, p-value. Confidence intervals (Z and T for one population).

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Teaching Methods

Lessons + practical sessions (both traditional exercise session + lab sessions with R software). Practical sessions are finalized both to fix theoretical concepts exposed during the lessons and to allow students to learn how to conduct data analytics in a real world setting.

Group projects will be carried out during the course, in order to be discussed at the end as a part of the evaluation (see evaluation section below).

Students are encouraged to actively participate to the lectures with questions and comments.

Assessment

The course assessment will consist of two parts, namely an individual written exam and a team project. Both parts are mandatory.

The written exam will be taken in one of the dates scheduled by the School within the academic year; it will consist of some multiple choice questions (Part A) and exercises (Part B) possibly with the help of the software R, to be solved autonomously in maximum 2:00 hours. At the end of the exam the student will decide whether or not to have their exam evaluated.

The written exam will be evaluated with a score expressed in a scale from 0 to 30, the maximum evaluation being 32/30. The written exam will be passed upon obtaining a score greater than or equal to 18/30. The exam evaluation will account for the degree of cla(gr)5(ee).eexa

Texts

- *Bland, M.: An Introduction to Medical Statistics - 4th Edition, Oxford University Press, 2015.*
- *Hosmer, D., Lemeshow, S.: Applied Survival Analysis. John Wiley & Sons.*
- *Agresti, A.: Categorical Data Analysis, Wiley Interscience.*
- *Ieva, F., Masci, C., Paganoni, A.M.: Laboratorio di Statistica con R,*

Further readings and references will be suggested step by step by the teacher.